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DRAWINGS ATTACHED



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## (54) IMPROVEMENTS IN OR RELATING TO ADJUSTABLE FOLDING APPARATUS FOR WEB-FED ROTARY PRINTING PRESSES

(71) We, SCHNELLPRESSENFABRIK FRANKENTHAL ALBERT & CIE. AKTIENGESellschaft, a German Company of 18 Lamb-sheimer Strasse, Frankenthal/Pfalz, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 The present invention relates to adjustable folding apparatus for web-fed rotary printing presses.

15 Folding apparatus is known for handling different formats, printed on web-fed rotary printing presses, with the folding apparatus connected to the main drive of the machine, the web of paper running to the folding apparatus more rapidly from the peripheries of large-sized forme cylinders than from the peripheries of smaller-sized forme cylinders at the same rotational speed.

20 In the known folding apparatus, a separate pair of grooved cutter cylinders are provided which, according to the feed velocity of the web of paper, sever the corresponding lengths of format therefrom and feed them to a transfer cylinder which compensates for the differences in the peripheral speeds of the fed and folding apparatus cylinders occurring in accordance with the varying lengths of format, and transfers the severed copies to the folding or collecting cylinder on which the accumulated or unaccumulated copies are folded and then received by the folding flap cylinder.

25 On the other hand, folding apparatus is also known wherein the folding or collecting cylinder cooperates with only one cutter cylinder and a folding flap cylinder. In such an apparatus the cylinder has a longitudinal row of retractable needles to grip the web. The apparatus cannot be adjusted, since the needles puncture the beginning of the as yet unsevered web of paper immediately at the commencement of an operating cycle, and because it is necessary for the speed of the web of paper and the peripheral

speed of the folding cylinder to coincide.

The object of the present invention is to provide an adjustable folding apparatus which has as few cylinders as the aforementioned point spur apparatus. The latter however, for the reasons mentioned, cannot and should not be adjustable. This object is based on the knowledge that the technical expense, the cost, the susceptibility to failure, and the difficulty of adjusting such folding apparatus increases with the number of cylinders.

30 In accordance with the present invention, an adjustable folding apparatus for web-fed rotary printing presses comprises a cutter blade cylinder cooperable with a transfer cylinder to provide a web receiving nip, the transfer cylinder carrying around the periphery thereof groups of web engaging members, each group comprising a gripper for engaging a leading edge of a web emerging from the nip, a fold blade cooperable with a fold blade jaw in a third cylinder and a support cooperable with an associated blade in the cutter cylinder, the peripheral positions of the gripper and fold blade being adjustable relative to the peripheral position of the support about the axis of rotation of the transfer cylinder whereby to cater for different sizes of sheets.

35 Cutting and folding are effected on a single cylinder. The invention on the one hand enables the distances or pitch between the individual operating units on the transfer cylinder to be adapted to the changing lengths of format by simple means, whereas, on the other hand, the accurate meeting of blade and rubber strip or folding blade and folding flap necessary for faultless operation is ensured.

40 Preferably, a belt guide moves with, and extends peripherally of, the transfer cylinder in a region between the cutter cylinder and the third cylinder and has an operative run which is displaceable in the same direction as the transfer cylinder. Since the copy is guided smoothly and at a constant speed

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 5 between the transfer cylinder and the belt guide after it has been severed from an oncoming web of paper, a second layer can be collected thereon, the grippers then opening and gripping so that collecting remains possible despite only one row of grippers.

10 The arrangement of one or a plurality of additional pressure rollers in the train of the belt guide may be provided to urge the belt guide against the transfer cylinder whereby to assist the tearing-off of any copies not completely severed from the web of paper and their acceleration to the peripheral speed of the collecting cylinder.

15 One embodiment of the present invention is illustrated schematically by way of example in the accompanying drawings in which:—

20 Figure 1 is a cross section of the apparatus.

Figure 2 illustrates the angular position of the parts for a maximum format.

Figure 3 illustrates the angular position of the parts for a minimum format.

25 In the construction illustrated a paper web 1, after being processed by a printing mechanism (not shown) and comprising one or more layers, is fed by a feed roller 2 having an associated rubber roller 3, and a further pair of feed rollers 4 having guides 5, to a position between a cutter cylinder 6 and a transfer cylinder 7 constituting the cylinder portion of the folding apparatus.

30 It is assumed in the illustrated embodiment that the speed of the web of paper 1 is only slightly less than the peripheral speed of the cutter cylinder 6 and the transfer cylinder 7, since a maximum format  $a$  is being printed which can extend between the positions A and B (Figure 2). The leading edge of the paper web 1, first located at A, then moves further in the direction of rotation indicated by the arrow D and, with the assistance of a brush roller 13 and an endless belt guide 14, the operative run of which is driven in the same direction as, and at the same speed as the peripheral speed of, the transfer cylinder 7, arrives at the position B at the end of a working cycle.

35 At this location and at this instant, the leading edge of the web is caught by one row of grippers 16 which grip the web in cooperation with gripper ribs 17. Simultaneously, the paper web 1 is severed at A by a knife 9 which is mounted in a knife bar 8 in the cutter cylinder 6 and cooperates with a rubber strip 10 of the collecting cylinder. The severed copy is then further conveyed (now at the exact peripheral speed of the transfer cylinder) between the transfer cylinder 7 and the belt guide 14 and is transferred to a folding blade or flap cylinder 19, the copy being provided in a conventional manner with its transverse fold by 65 the cooperation between a folding blade 21

on the cylinder 7 and a folding flap 20 on the cylinder 19, with the blade 21 actuated by a folding blade spindle 22.

70 As may be seen from the drawing, the peripheries of the cutter cylinder 6 and the folding blade or flap cylinder 19 are dimensioned so that these cylinders accomplish two working cycles, or process two copies at each revolution, whereas the periphery of the transfer cylinder 7 is such that one revolution of the cylinder corresponds to three working cycles. It will be appreciated, however, that the cylinders may be desired for different pitches; thus for example the transfer cylinder may have a five-fold 80 pitch.

85 In the three-fold pitch of the transfer cylinder 7 illustrated in the drawing, three stellate, tripartite carriers 11, 18 and 23 are releasably and clampably arranged on a common axle 12, the rubber strips 10 being carried by the one carrier 11, the gripper devices 16, 17 by a second carrier 18, and the transverse folding devices 21, 22 by the third carrier 23. Means such as a geared drive ensures in a suitable known manner that on the one hand the rubber strip carrier 11 and the cutter cylinder 6 and on the other hand the folding blade carrier 23 and the folding flap cylinder 19, are coupled to each other so that they work synchronously and their positions relative to each other are maintained.

90 For the purpose of folding smaller formats, the paper web 1 arrives at a speed which is substantially lower than the peripheral speed of the transfer cylinder 7. The leading edge of the paper web 1 located at A at the commencement of a working cycle (as described above) has not arrived at B at the end of the working cycle, but is located nearer to the point A. In order that the copy (which has to be severed from the paper web 1 simultaneously with the end of the working cycle) may be gripped by the grippers 16 in a satisfactory manner at this location also, the gripper carrier 18 and the folding blade carrier 23 are released from the axle 12 (the rubber strip carrier 11 being locked for example), whereupon the gripper carrier 18 and the folding blade carrier 23 are turned back in the direction opposite to the direction of rotation D to the full extent indicated by the reference  $e$  (Figure 2) and half the extent indicated by  $f$  respectively 105 of the extent of the shortening of the format and are then clamped again, as illustrated for a smaller format by dash-dot lines in the drawing in the top left third of a segment of the transfer cylinder 7. By virtue of the geared drive, the folding flap cylinder 19 thereby turns to the same extent as the folding knife carrier 23, so that they remain in synchronisation. The spaces of variable size remaining on the transfer 130

cylinder 7 between the individual carrier parts are bridged by bridges 15.

Since the paper web 1 arrives at a speed substantially below the peripheral speed of the transfer cylinder 7 when the size of the format is reduced, the web first of all slides between the transfer cylinder and the belt guide 14. Its speed is accelerated to full speed and it is carried along only at the instant in which the grippers 26 grip and the copy is severed from the web of paper 1 by a knife 9. To enable the work cycle to proceed without obstruction even in the event of mere indentation or other incomplete severing of the copies, a tearing-off of the copies from the web and the acceleration of the copies to the peripheral speed of the transfer cylinder are assisted by providing the belt guide 14 with at least one pressure roller or pulley 24 whose contact pressure is adjustable so that it is still possible for the web of paper 1 to slide between the transfer cylinder 7 and the belt guide 14 before the severing operation.

In Fig. 3,  $a^1$  represents a minimum format being printed and extending between positions  $A^1$  and  $B^1$ , the latter corresponding to positions A and B in Fig. 2.

#### WHAT WE CLAIM IS:—

1. An adjustable folding apparatus for web-fed rotary printing presses comprising a cutter blade cylinder cooperable with a transfer cylinder to provide a web receiving nip, the transfer cylinder carrying around the periphery thereof groups of web engaging

members, each group comprising a gripper for engaging a leading edge of a web emerging from the nip, a fold blade cooperable with a fold blade jaw in a third cylinder and a support cooperable with an associated blade in the cutter cylinder, the peripheral positions of the gripper and fold blade being adjustable relative to the peripheral position of the support about the axis of rotation of the transfer cylinder whereby to cater for different sizes of sheets.

2. Folding apparatus as claimed in Claim 1, in which a belt guide moves with, and extends peripherally of, the transfer cylinder in a region between the cutter cylinder the third cylinder and has an operative run which is displaceable in the same direction as the transfer cylinder.

3. Folding apparatus as claimed in Claim 2, in which each group comprises only one row of grippers which can engage and collect a plurality of layers of sheets.

4. Folding apparatus as claimed in Claim 2 in which the belt guide is urged against the transfer cylinder by one or more adjustable pressure rollers or pressure pulleys.

5. An adjustable folding apparatus for web-fed rotary printing presses constructed and arranged to operate substantially as described with reference to, and as illustrated in, the accompanying drawings.

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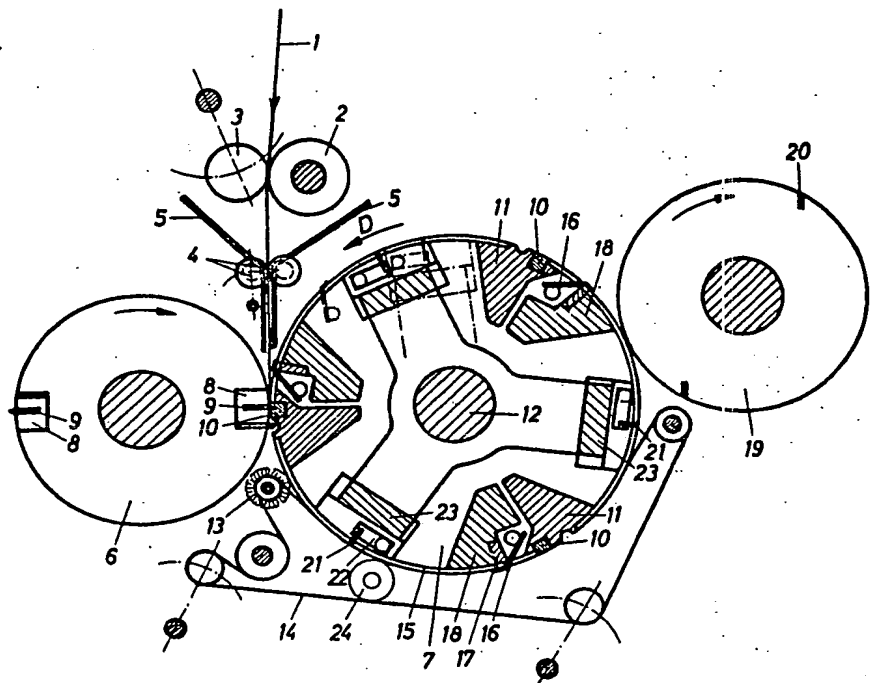
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COMPLETE SPECIFICATION

2 SHEETS

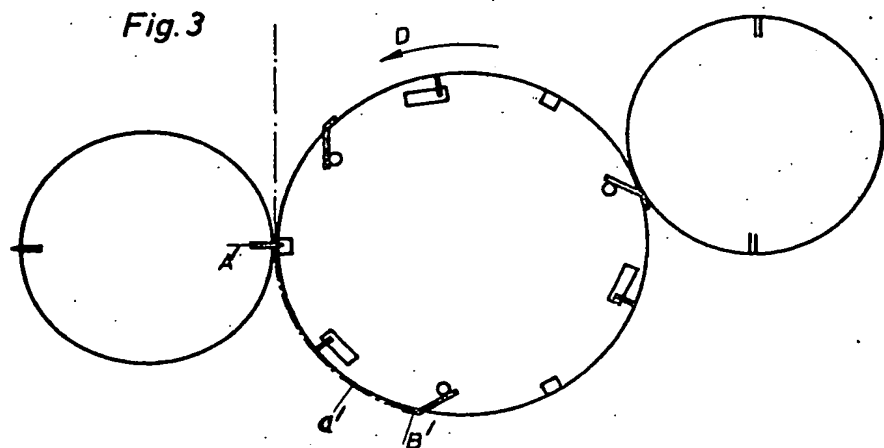
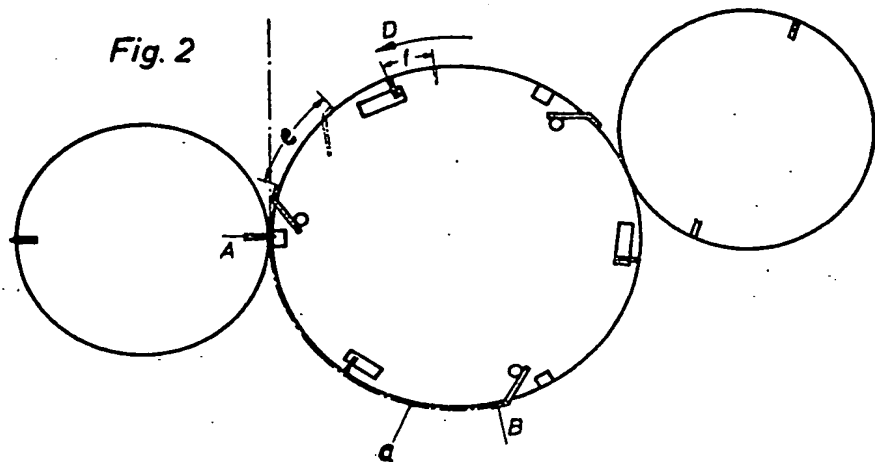
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Fig. 1



## COMPLETE SPECIFICATION

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